Date: Mon, 27 Sep 93 04:30:24 PDT
From: Ham-Homebrew Mailing List and Newsgroup <ham-homebrew@ucsd.edu>
Errors-To: Ham-Homebrew-Errors@UCSD.Edu
Reply-To: Ham-Homebrew@UCSD.Edu
Precedence: Bulk
Subject: Ham-Homebrew Digest V93 #57
To: Ham-Homebrew

Ham-Homebrew Digest  Mon, 27 Sep 93  Volume 93 : Issue 57

Today's Topics:

Anyone interested in discussing PLL synt
Project 9: 2M CW transmitter

Send Replies or notes for publication to: <Ham-Homebrew@UCSD.Edu>
Send subscription requests to: <Ham-Homebrew-REQUEST@UCSD.Edu>
Problems you can't solve otherwise to brian@ucsd.edu.

Archives of past issues of the Ham-Homebrew Digest are available
(by FTP only) from UCSD.Edu in directory "mailarchives/ham-homebrew".



---

Date: 26 Sep 93 17:00:28 GMT
From: dog.ee.lbl.gov!agate!howland.reston.ans.net!sol.ctr.columbia.edu!
news.kei.com!ddsw1!indep1!clifto@network.ucsd.edu
Subject: Anyone interested in discussing PLL synt
To: ham-homebrew@ucsd.edu

In article <27smfj$q17@newscast.West.Sun.COM> myers@cypress.West.Sun.COM writes:
>In article 2489@indep1.UUCP, clifto@indep1.UUCP (Cliff Sharp) writes:
>>  I've thought for a long time about synthesizing my old Sears-su rock-bound
>>unit, which has a VFO input.  Sat down and did a little math, and the design
>>seems pretty straightforward; oscillators are in the 10-13 MHz range, etc.
>>The only problem I foresee is that tuning would require the VCO to change
>>frequencies at 833.3 Hz intervals, meaning to me that somewhere in the
>>chain, no matter how I design it, I'd end up using an 833.3 Hz frequency
>>standard.
>
>Yeah, but not necessarily.

  Let me clarify the reasons for choosing this particular frequency.  I've
received a lot of replies saying the same thing.

The manual for the Sears-su, by the way, contains a page marked "FT-223 parts list". They supposedly once made a synthesizer _add-on_ for this rig, but I haven't seen one at a hamfest since I bought the rig in the late 70's. Nor have I come across a schematic.

The transmit VFO frequency is (output/12), making the range I want 12.0000 to 12.333333 MHz in 416.666 Hz steps (5 KHz / 12). (Back when I started this, I was willing to accept 10 KHz steps, and forgot that when I posted my original article; nowadays, it wouldn't be practical, especially if I plan to use the unit on the local TCP/IP frequency of 147.555.)

The receive VFO frequency is (signal - 10.7 MHz)/9, giving a range of 14.811111 to 15.255555 MHz in 555.555 Hz steps. (How did I ever manage my original idea??? This isn't making sense even as I type it.)

So the actual idea was that my frequency standard would be 1 MHz divided by 1800 for receive, and by 1200 for transmit. (THAT'S how I imagined it.)

Of course, we run the VCO at the desired VFO frequency in either event, use a programmable divider between the VCO output and the phase detector, and phase-lock the divider output to the reference. Then a bit of filtering of the VCO output produces a nice sine wave to drive the rig.

>> That's not hard to produce, even with extreme accuracy; we have a local
>>AM station at 1000 KHz that I could phase-lock to for a frequency standard
>>and then divide down.
>
>You don't need to phase lock to some external standard; none of my PLL radios
>do. The normal approach is to use a crystal oscillator to provide a standard
>frequency.

A 1 MHz crystal would be fine for the purpose, with a little tuning. In my original post, I merely meant to point out that the exactness of the "833.333 Hz" source was not a consideration, because even if I had to go to extremes to avoid crystal trimming, drift, and the like, I always had the alternative of creating the master frequency standard by phase-locking to WCFL at 1 MHz and using their high-precision oscillator instead.

Put another way, what I was trying to do by stating that was to note that standard accuracy was not a problem in this case; what I thought would be a problem were things like slow lock, tendency to lose lock with supply voltage variations and/or noise, etc.

>Using such a low reference frequency is going to create a real problem in
>your design with loop lock-up time and (more importantly) reference sideband
>suppression. Your loop filter design will need to provide a very high amount
>of rejection of the 400 Hz reference present in the phase comp output;
practically
>speaking, you won't be able to realize a good enough loop filter for this. The
>problem with insufficient reference sideband suppression is that your radio,
>after mulitplying the VCO by 12, will have birdies every 5KHz on 2m.

Second point first; "in my dreams", the unit itself would be well enough shielded that the only available output would be the VFO frequency. Since this would be the direct output of the PLL VCO, I would imagine the birdies wouldn't be there; in any event, since I'd have to waveshape the VCO output anyway, there'd be a multistage 12-16 MHz bandpass filter on the output which should easily take care of the 416 or 555 Hz problems. Only problem I see would be providing good enough shielding to avoid coupling to other parts of the radio.

First point; just what I was worried about. It would be fine to allow 1/2 to 3 seconds for receive lock; but that wouldn't be nice for transmit.

>A good way to avoid this and still realize your goal is to build a 2m synthesizer.
>Yup; run a VCO at the desired operating frequency. Then, use a prescaler to
>divide it by 12. This way, using the Motorola MC145170, you can build a single
>loop synthesizer which directly generates the required VHF signal using a 5KHz
>reference and no heterodyne oscillators.
>The output of the divide-by-12 circuit would be the VFO input. The radio, I assume,
>would phase modulate this without any problem.

Wouldn't even need to divide it down, really; I could just bypass the multiplier stages already in the rig and go direct to the target. But the nightmare of trying to generate a 146.94 MHz (square wave) signal, or 147.555, seems more formidable to me than approaching it from the low end.

Also doesn't ease the process when I get around to generating that LO frequency, either. (The subtract-and-divide-by-9.)

>I would recommend that you verify spectral performance of the synthesizer using
>a spectrum analyzer before operating on the air, as I recommend whenever building
>a frequency synthesizer.

Goes without saying! :-) I wouldn't even attach it to a dummy load before 'scoping the output and seeing a VERY pretty sine wave, much less checking for spurs while the dummy load was attached.

A final note: I took this on strictly as a challenge, "because it's there". It would undoubtedly be easier for me to find someone selling a broken rig cheap and then fixing it myself (I'm counting pennies 'cause my bad back has kept me from working very much). But that would be old-hat for me, and synthesizing this FT-223 would be an accomplishment...

--
+-----------------------------------------------------------------------------+
| Cliff Sharp | clifto@indep1.chi.il.us OR clifto@indep1.uucp |
| WA9PDM | Use whichever one works |
+-----------------------------------------------------------------------------+

---

Date: Mon, 27 Sep 1993 02:40:20 GMT
From: news.Hawaii.Edu!uhunix3.uhcc.Hawaii.Edu!jherman@ames.arpa
Subject: Project 9: 2M CW transmitter
To: ham-homebrew@ucsd.edu

Here's the first of two 2M xmtrs: this one is a 2-transistor CW rig and the other is a 3-transistor AM circuit which you can FMize yourself (of course the AM xmtr can be used for CW, too). Here's what Burt Simon in 104 HAM RADIO PROJECTS FOR NOVICE AND TECHNICIAN (1968) has to say:

"Here's a dandy 2-meter CW rig that will astound the local gang. Using only 2 transistors and a 72 MHz third overtone crystal, you can practically carry the set around with you. It can be built into the tiniest of boxes and requires only a 9-volt battery to power it. At least one VHFer has worked 110 miles with this transmitter, and several (built as club projects) have been equipped with simple one-transistor modulators.

"Construction is simple, although care must be taken to insure that all leads are as short as possible. L3 should have its iron-core slug removed. The RFCs are simple 1/2 watt resistors wound full of #36 enameled wire. To check their efficiency, use a grid dip meter to see if you're anywhere near 144 MHz. If they aren't, remove or add turns until the desired frequency (should correspond with your transmit frequency) is achieved. L1 should be neutralized by winding a full solenoid of #26 wire on a 1 meg, 1 watt resistor. Leaving only about 1/2-inch of lead, solder the choke to the crystal socket. It should resonant at your operating frequency.

"Main thing is to get the crystal to oscillate. If you have trouble, adjust L2 and expand or compress the turns of L1 until you hear (using a 2-meter receiver) the oscillator harmonic. From here on in you can simply tune for maximum signal using a GDO, field strength meter, or receiver S meter."

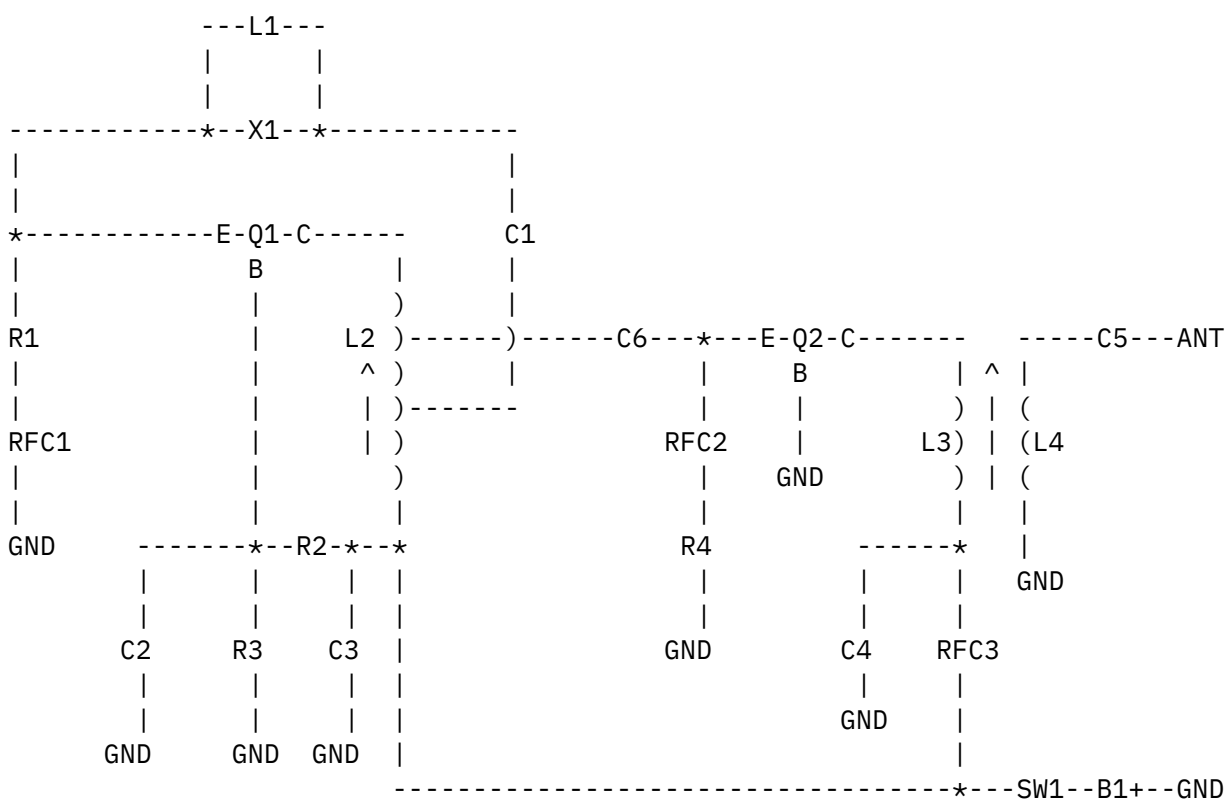
Parts List

| | |
|---|---|
| Q1, 2 | 2N1745 transistor |
| C1, 2 | .001 mF capacitor |
| C3, 4 | .01 mF |
| C5 | 50 pF |
| C6 | 12 mF, 5% |
| R1 | 510 ohm resistor |
| R2 | 30K |
| R3 | 10K |
| R4 | 100 ohms |
| B1 | 9vdc battery |
| L1 | 19 turns #24 enameled wire on 1 meg, 1 watt resistor |
| L2 | 9 1/2 turns #24 enameled wire on 5/16 inch slug-tuned form |
| L3 | 6 1/2 turns #24 enameled wire, spaced 1/6 inch on 5/16 inch slug-tuned form |
| L4 | 1 3/4 turns #22 enameled wire on cold end of L3 |
| RFC1,2,3 | #36 enameled wire wound (and glued) on 1/2 watt resistor. Should |

check to approximately 145 MHz with GDO. If it doesn't, adjust number of turns. (Ohmite Z-144)

X1 72 MHz 5th overtone crystal

SW1 SPST switch




Notes: Observe good VHF wiring techniques (we can't be as sloppy here as we are down on the HF bands!) The positive pole of B1 goes to ground. I attempted to use arrows to indicate the adjustable coil forms. Nothing was said about the two taps coming off of L2 - you'll have to experiment as to their placement. C1 jumps over the other tap from L2.

If any of you build this pup let the rest of us know how you got it to work.... (who in the world has even got 72 MHz xtals anymore?)

Jeff NH6IL (ex WA6QIJ)

---

Date: Mon, 27 Sep 1993 06:59:48 GMT
From: sdd.hp.com!elroy.jpl.nasa.gov!grian!morris@network.ucsd.edu
To: ham-homebrew@ucsd.edu

References <nagleCDqo4H.1AC@netcom.com>, <1993Sep23.222535.14535@muug.mb.ca>,
<nagleCDuEvE.IGz@netcom.com>
Subject : Re: Cell phone parts for AmRadio?

nagle@netcom.com (John Nagle) writes:

>bwalzer@muug.mb.ca (Bruce Walzer) writes:
>>How do typical cell phones reject the reciever image? They have to receive
>>a band 20+ MHz wide. That would make the common 10.7 MHz IF freq not useful
>>so really cheap ceramic filters are out.

>      They have to tune across a band 20MHz or so wide, but the IF bandwidth
>is only 30KHz.

>      The Signetics app note suggests a 45MHz first IF and a 455KHz
>second IF, front-ended by a duplexer, a preamp, a broadband filter,
>and a first mixer.  The frequency synthesizer feeds the first mixer.
>So nothing beyond the first mixer needs a bandpass exceeding 30KHz.

>      There's a suggestion that a 80-90MHz first IF with SAW filters could be
>better, but Signetics claims that a NE605 with ceramic filters is good
>enough to meet the specs for cell phones.  I don't know much about SAW
>filters, though.

>      If you're really interested in using these parts, get the Signetics
>RF data book.  It's full of good application notes, which you need; building
>tiny-scale RF gear with huge gains requires very careful layout, and they've
>already done the necessary experimental work.

>                      John Nagle

SAW filters are available for channel 3 and 4 TV - so an IF in this area
can use commonly available parts.  I once saw a 900mhz Motorola traffic
light control system that used a 150.0 mhz mobile receiver with a 900mhz
converter ahead of it.  The receiver was a stock Motrac but with a 100kc
wide IF fiter.  The 900mhz converter was a 450 BBT series front end with
the tuned lines trimmed in half, and had an extra doubler on the local
oscillator.
--
Mike Morris   WA6ILQ   | This space intentionally left blank.
PO Box 1130            |
Arcadia, CA. 91077     | All opinions must be my own since nobody pays
818-447-7052 evenings  | me enough to be their mouthpiece...

------------------------------

End of Ham-Homebrew Digest V93 #57

**********